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ARTIFICIAL INTELLIGENCE AND CENTRAL BANK COMMUNICATION: THE CASE OF THE ECB

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Artificial Intelligence and Central Bank Communication: The Case of the ECB

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Abstract:
We examine whether artificial intelligence (AI) can decipher European Central Bank's communication. Employing 1769 inter-meeting verbal communication events of the European Central Bank's Governing Council members, we construct an AI-based indicator evaluating whether communication is leaning towards easing, tightening or maintaining the monetary policy stance. We find that our AI-based indicator replicates well similar indicators based on human expert judgment but at much higher speed and at much lower costs. Using our AI-based indicator and a number of robustness checks, our regression results show that ECB communication matters for the future monetary policy even after controlling for financial market expectations and lagged monetary policy decisions.

JEL: E52, E58
Keywords: Artificial intelligence, central bank communication, monetary policy

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1 Introduction

In this short paper, we employ artificial intelligence (AI) to study the European Central Bank (ECB) communication. We are interested in the performance of the AI methods (ChatGPT 3.5 and ChatGPT 4[1]), i.e., whether they can compete with the commonly used human assessment of central bank communication.[2] For this reason, we use the rich dataset of 1769 communication events of the ECB's Governing Council members in 2008–2016 from Gertler and Horvath (2018) and Bennani et al. (2020). Using this dataset, we construct the indicator evaluating the content of communication events, more specifically, whether the ECB communication is leaning towards tightening, easing or maintaining the monetary policy stance. We compare our AI-based indicator with the one developed by Gertler and Horvath (2018) and Bennani et al. (2020). Several other articles evaluate the ECB communication and find that the communication is informative and explains future monetary policy (Hayo and Neuenkirch, 2010; Pesci, 2016; Tobback et al., 2017; Picault and Renault, 2017; Sturm and de Haan, 2011; Bennani and Neuenkirch, 2017; Baranowski et al., 2023). We differ from this body of literature in two major aspects: 1) we use the AI and 2) we employ the ECB verbal communication between monetary policy meetings.[3].

We find that our AI-based indicator replicates well the human-based indicator by Gertler and Horvath (2018) and Bennani et al. (2020). Estimating various ordered probit regressions, we find that our AI-based communication indicator is informative for future monetary policy, one, two and three meetings ahead. This result holds even if we control for financial market expectations and lagged monetary policy decisions. The advantage of our indicator lies in the ease of using it. While the previous approaches typically hinged upon time-consuming human assessment of central bank communication events, the AI-based approach is fast and therefore less expensive.

The paper is organized as follows. Section 2 presents data. Section 3 provides regression results. Conclusions are available in Section 4. Appendix with additional regression results follows.

2 Data

We use the dataset from Gertler and Horvath (2018) and updated by Bennani et al. (2020). The dataset contains 1769 communication events of ECB's Governing Council member in 2008M06

[1] Chat Generative Pre-trained Transformer - GPT, a large language model based chatbot developed by OpenAI.

[2] See Dowling and Lucey (2023) and Zaremba and Demir (2023) on the potential of how AI can be used by finance researchers.

[3] The literature typically focuses on communication released in and around the monetary policy. This is also the case for (Hansen and Kazinnik, 2023), who use artificial intelligence chatbot to examine the statements following the monetary policy meeting of the US Federal Reserve to determine the monetary policy stance and to identify monetary policy shocks. Hansen and Kazinnik (2023) show that GPT models outperform some state-of-the-art natural language processing models in terms of the deciphering the central bank communication and are on par with human assessment. Alternatively, the literature examines the informativeness of the voting record for future monetary policy (Riboni and Ruge-Murcia, 2014; Horvath et al., 2012) but given the consensual nature of actual decision-making in the ECB, the voting records are not available. Closely related is also an empirical literature using the textual analysis of ECB-related documents (Tobback et al., 2017; Fraccaroli et al., 2023)

- 2016M05 that appeared Reuters News. The dataset contains statements on (conventional and unconventional) monetary policy and has a forward-looking character. Gertler and Horvath (2018) and Bennani et al. (2020) classify the policy statements in three categories: monetary tightening, *status quo* and easing. The categories are assigned the values of 1, 0, -1, respectively. The details regarding the dataset are available in Gertler and Horvath (2018) and Bennani et al. (2020).

We use the same approach for the AI assessment of the tone of the communication as in Gertler and Horvath (2018) and Bennani et al. (2020). but using the models GPT4 and GPT 3.5 Turbo. Generally, in terms of performance, the model GPT 4 is superior to GPT 3.5 Turbo, however it comes with higher costs and lower speed. In addition to that our analysis has been carried out using zero and single shot approaches. While the former means that the AI was not given any prior examples and the latter means that one example was provided in the prompt. To be more specific, the single shot prompts always included one example for each possible statement (easing, tightening and *status quo*).

As we will see adding more instructions/examples into the prompt does not necessarily have to lead to a better efficiency. The reason for that could be that the language model can be given an example that may be too restrictive which would lead to an incorrect assessment of future statements. For this reason the analysis contains both single and zero shot prompts. The prompts and examples of the classification of selected statements can be found in the Appendix.

Next, using the AI we construct the variable $comm_\tau$ and compare its evolution with the $comm_\tau$ variable based on human assessment in Gertler and Horvath (2018) and Bennani et al. (2020). We construct $comm_\tau$ as follows. The individual communication event, i, in the inter-meeting period, τ, can yield the values g_i, where $g_i \in \{-1, 0, 1\}$. Note that τ denotes a time period between the monetary policy meetings in time t and $t+1$. We denote that the value of communication event g_i belongs to time period τ as $g_{i,\tau}$. Consequently, $comm_{i,\tau}$ is defined as

$$comm_{i,\tau} = average(g_{i,\tau}) \tag{1}$$

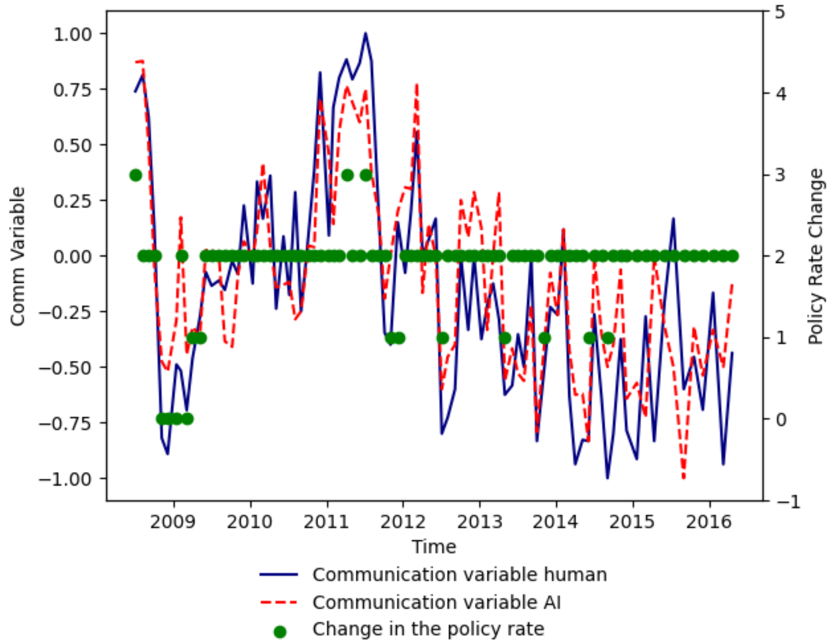
Therefore, our approach groups the individual communication events into 89 inter-meeting intervals. As a robustness check, we consider a subset of our dataset excluding the period characterized by the zero lower bound (i.e., excluding the data from 2014M1 to 2016M5), for which the efficacy of monetary policy can be limited (Swanson and Williams, 2014).[4]

First, we visually compare the performance of our AI-based $comm_{i,\tau}$ using the scatter plots. We denote our indicator as $comm_{AI,i,\tau}$ and the one by Gertler and Horvath (2018) and Bennani et al. (2020) as $comm_{human,i,\tau}$. The Figures 1-4 present the development of actual change in the the ECB's monetary policy rate with $comm_{AI,i,\tau}$ and $comm_{human,i,\tau}$. We present four different versions of $comm_{AI,i,\tau}$ depending on whether we use ChatGPT 3.5., ChatGPT4 both zero and single shots. We observe that $comm_{AI,i,\tau}$ and $comm_{human,i,\tau}$ are closely related

[4]Note that this robustness checks also addresses the potential effect of the change in the ECB's monetary policy voting scheme implemented in 2015.

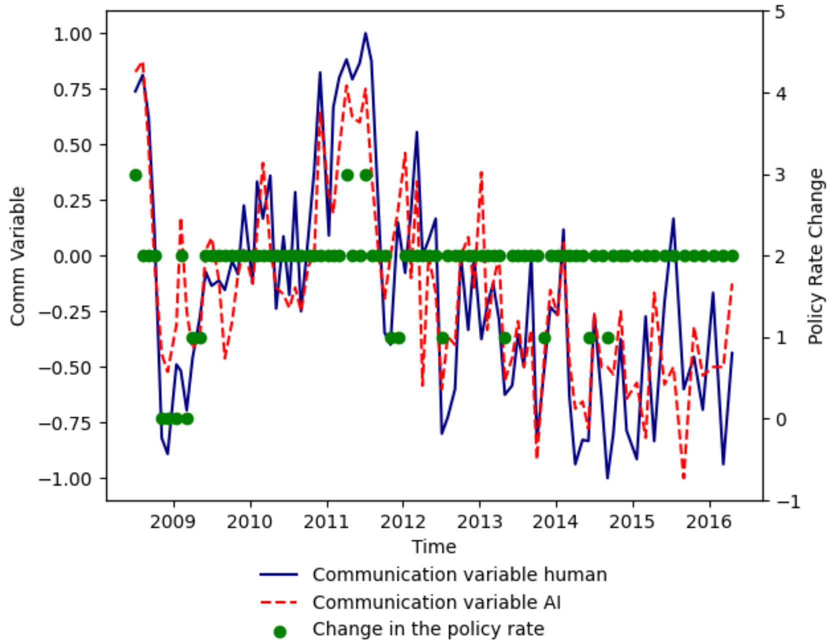
suggesting that AI can decipher the central bank communication as precisely as human expert judgment.

Figure 1: ECB's communication and changes to monetary policy (encoded via zeroshot Chat-GPT4)



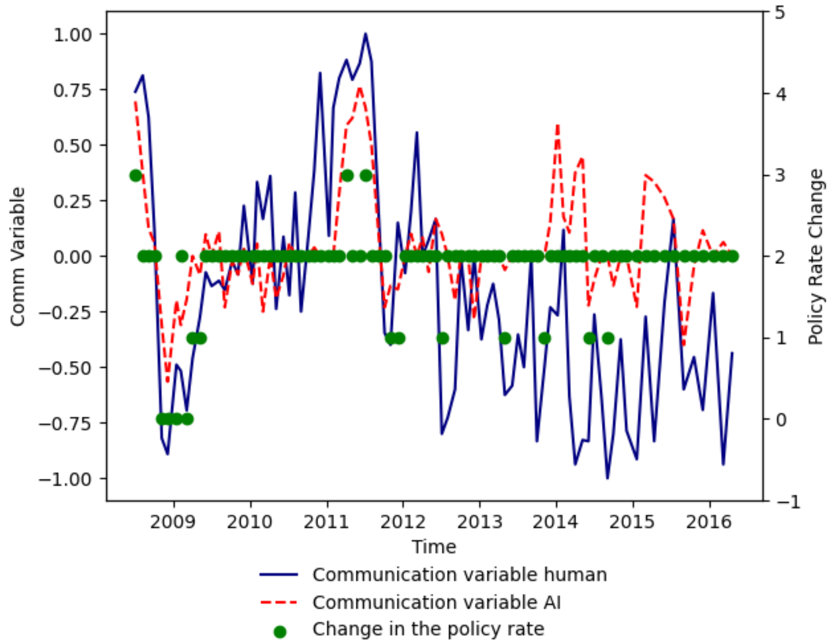
Notes: The figure presents the ECB's verbal communication indicatora variables encoded manually and via AI and future monetary policy rate change Δi_{t+1}.

Figure 2: ECB's communication and changes to monetary policy (encoded via singleshot Chat-GPT4)



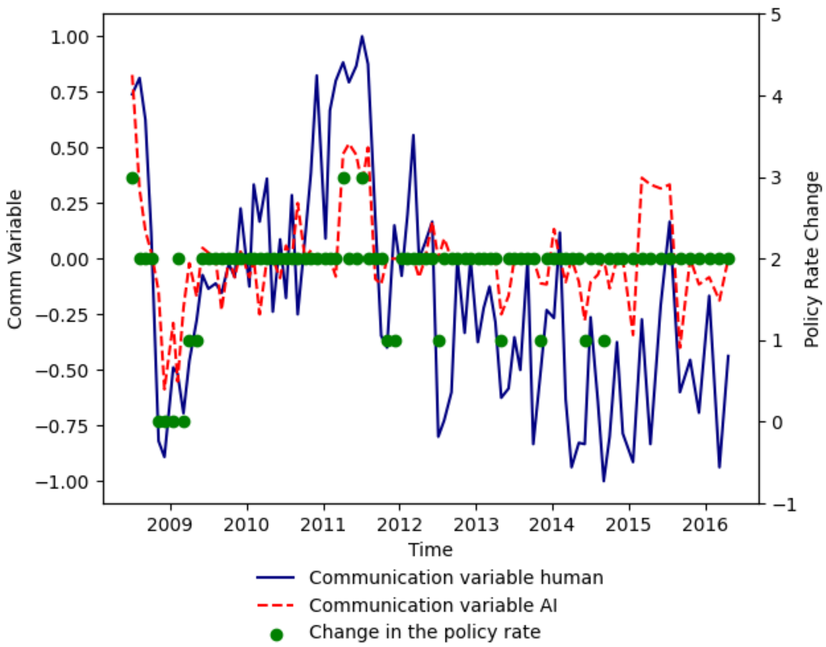
Notes: The figure presents the ECB's verbal communication indicatora variables encoded manually and via AI and future monetary policy rate change Δi_{t+1}.

Figure 3: ECB's communication and changes to monetary policy (encoded via zeroshot Chat-GPT 3.5 Turbo)



Notes: The figure presents the ECB's verbal communication indicatora variables encoded manually and via AI and future monetary policy rate change Δi_{t+1}.

Figure 4: ECB's communication and changes to monetary policy (encoded via singleshot ChatGPT 3.5 Turbo)



Notes: The figure presents the ECB's verbal communication indicatora variables encoded manually and via AI and future monetary policy rate change Δi_{t+1}.

3 ECB Communication and Future Monetary Policy: Ordered Probit Estimations

We evaluate the performance of our AI-based indicator, $comm_{AI,i,\tau}$, in a well-established econometric framework Gerlach-Kristen (2004); Horvath et al. (2012); Horvath and Jonasova (2015). We examine whether our indicator, $comm_{AI,i,\tau}$, helps explain the future course of monetary policy controlling for the past monetary policy decisions and financial market expectations. The model is estimated using the ordered probit to appreciate the censored nature of the dependent variable.

We estimate the following regression model:

$$\Delta i_{t+1} = \beta_0 + \beta_1 \Delta i_t + \beta_2 comm_{AI,i,\tau} + \beta_3 (i_{t,L} - i_{t,S}) + u_{t+1} \quad (2)$$

Δi_t denotes the change in the main refinancing operation (MRO) rate at time t and $comm_{AI,i,\tau}$ captures our AI-based communication indicator based on information between monetary policy meeting in t and $t+1$. In line with previous literature (Gerlach-Kristen, 2004; Horvath et al., 2012; Horvath and Jonasova, 2015), we control for financial market expectation by including the slope of the money market curve. We use the Euribor 1-, 3- and 12-month market rates to determine the difference in $i_{t,L}$ and $i_{t,S}$, i.e. a money market rate with a longer and shorter maturity one day before the monetary policy meeting.[5]

Our baseline regressions are based on a full sample (2008–2016). To address the potential effect of zero lower bound (Swanson and Williams, 2014), we estimate the regressions using a restricted sample (2008–2014). These alternative regressions are presented in Appendix.

To provide a direct comparison of the performance of our AI-based indicator, $comm_{AI,i,\tau}$, vis-a-vis the indicator based on human expert judgment, $comm_{human,i,\tau}$, our regression tables contain the regressions with $comm_{AI,i,\tau}$ in the odd columns, while the regressions with $comm_{human,i,\tau}$ are located in even columns.

Tables 1-4 present our main regression results. Table 1 show the regression results with our AI-based communication indicator generated using the zero shot GPT3.5. The results show that the AI-based communication indicator ($comm_{AI,i,\tau}$) is positive and statistically significant in all regressions irrespective the way we control for financial market expectations. Therefore, the results suggest that the words of ECB representatives are matched with the deeds (i.e., monetary policy changes); the communication towards tightening of the monetary policy is followed by the policy hike. Interestingly, we observe this result despite our sample includes a period when the rates hit the zero lower bound and the ECB implemented a number of unconventional monetary policy measures such as the forward guidance. In addition, the result remain largely unchanged when we use single shot GPT3.5 model (Table 2), zero shot GPT4 model (Table 3) or single shot GPT4 model (Table 4). We re-estimate the regression results presented in Tables Tables 1-4 using a restricted sample up to 2014 to avoid the issues linked to zero lower bound. These results are available in Tables A2-A5 in the Appendix. Again, the regression results remain largely unchanged suggesting the potential of our AI-based communication indicator.

The human expert judgment index is also statistically significant suggesting that we can use both indexes, either AI-based or human-based. Overall, the results are in line with previous evidence suggesting that transparent and consistent communication improves the monetary policy predictability (Gerlach-Kristen, 2004; Horvath et al., 2012; Horvath and Jonasova, 2015).

4 Concluding Remarks

In this short paper, we examine the ability of AI to replace the human expert judgment in analyzing the complicated language of central bank communication. We use the ECB intermeeting ad-hoc communication (verbal communication such as speeches, interviews, statements) in 2008–2016, construct the indicator evaluating the tone of communication using GPT3.5 and GPT4 and assess the performance of the indicator in the ordered probit regressions.

Our results suggest that our AI-based communication indicator helps explain the ECB monetary policy changes even after controlling for past monetary policy decisions and financial

[5] See Bennani et al. (2020) on why we prefer Euribor to EONIA.

Table 1: ECB Communication and Future Monetary Policy - Zero Shot GPT3.5

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.42	0.65**	0.33	0.65**	0.43	0.59**	0.39	0.33
	(0.28)	(0.27)	(0.29)	(0.27)	(0.28)	(0.27)	(0.30)	(0.30)
$comm_{AI,i,\tau}$	4.35***		3.87***		4.12***		4.38***	
	(1.12)		(1.11)		(1.12)		(1.13)	
$comm_{human,i,\tau}$		2.02***		2.03***		2.57***		2.57***
		(0.53)		(0.61)		(0.68)		(0.60)
$i_{t,12} - i_{t,3}$			1.93*	-0.03				
			(1.17)	(1.39)				
$i_{t,12} - i_{t,1}$					0.72	-1.47		
					(0.76)	(1.03)		
$i_{t,3} - i_{t,1}$							-0.44	-4.04**
							(1.47)	(1.75)
Log-Likelihood	-40.82	-41.26	-39.41	-41.26	-40.37	-40.19	-40.78	-38.41
No. observations	89	89	89	89	89	89	89	89
Pseudo R^2	0.29	0.28	0.32	0.28	0.30	0.30	0.29	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table 2: ECB Communication and Future Monetary Policy - Single Shot GPT3.5

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.30	0.65**	0.26	0.65**	0.32	0.59**	0.18	0.33
	(0.28)	(0.27)	(0.29)	(0.27)	(0.29)	(0.27)	(0.31)	(0.30)
$comm_{AI,i,\tau}$	3.89***		3.34***		3.73***		4.17***	
	(1.01)		(1.03)		(1.07)		(1.06)	
$comm_{human,i,\tau}$		2.02***		2.03***		2.57***		2.57***
		(0.53)		(0.61)		(0.68)		(0.60)
$i_{t,12} - i_{t,3}$			1.63	-0.03				
			(1.15)	(1.39)				
$i_{t,12} - i_{t,1}$					0.31	-1.47		
					(0.74)	(1.03)		
$i_{t,3} - i_{t,1}$							-1.47	-4.04**
							(1.45)	(1.75)
Log-Likelihood	-43.16	-41.26	-42.13	-41.26	-43.07	-40.19	-42.64	-38.41
No. observations	89	89	89	89	89	89	89	89
Pseudo R^2	0.25	0.28	0.27	0.28	0.25	0.30	0.26	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table 3: ECB Communication and Future Monetary Policy - Zero Shot GPT4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.81***	0.65**	0.78***	0.65**	0.81***	0.59**	0.59**	0.33
	(0.28)	(0.27)	(0.28)	(0.27)	(0.28)	(0.27)	(0.30)	(0.30)
$comm_{AI,i,\tau}$	2.07***		1.92***		2.43***		2.82***	
	(0.56)		(0.61)		(0.70)		(0.69)	
$comm_{human,i,\tau}$		2.02***		2.03***		2.57***		2.57***
		(0.53)		(0.61)		(0.68)		(0.60)
$i_{t,12} - i_{t,3}$			0.69	-0.03				
			(1.28)	(1.39)				
$i_{t,12} - i_{t,1}$					-0.88	-1.47		
					(0.93)	(1.03)		
$i_{t,3} - i_{t,1}$							-3.95**	-4.04**
							(1.72)	(1.75)
Log-Likelihood	-42.83	-41.26	-42.68	-41.26	-42.37	-40.19	-40.00	-38.41
No. observations	89	89	89	89	89	89	89	89
Pseudo R^2	0.26	0.28	0.26	0.28	0.27	0.30	0.31	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table 4: ECB Communication and Future Monetary Policy - Single Shot GPT4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.77***	0.65**	0.72***	0.65**	0.77***	0.59**	0.58**	0.33
	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.29)	(0.30)
$comm_{AI,i,\tau}$	1.76***		1.54***		1.95***		2.38***	
	(0.51)		(0.57)		(0.62)		(0.62)	
$comm_{human,i,\tau}$		2.02***		2.03***		2.57***		2.57***
		(0.53)		(0.61)		(0.68)		(0.60)
$i_{t,12} - i_{t,3}$			1.09	-0.03				
			(1.24)	(1.39)				
$i_{t,12} - i_{t,1}$					-0.48	-1.47		
					(0.86)	(1.03)		
$i_{t,3} - i_{t,1}$							-3.36**	-4.04**
							(1.60)	(1.75)
Log-Likelihood	-44.91	-41.26	-44.51	-41.26	-44.76	-40.19	-42.64	-38.41
No. observations	89	89	89	89	89	89	89	89
Pseudo R^2	0.22	0.28	0.23	0.28	0.22	0.30	0.26	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

market expectations. This result holds regardless whether we assess the communication using GPT3.5 or GPT4 models, both with zero shot or single shot version. In addition, when we estimate the regressions excluding the period characterized by the zero lower bound, the results still remain largely unchanged.

Consequently, our article shows that the significance of AI-based communication indicator is on par with the previously used human expert judgment communication indicators (Gertler and Horvath, 2018; Bennani et al., 2020). Overall, our result provide evidence that transparent and consistent central bank communication helps understand the future course of monetary policy.

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Appendix

Prompts Summary

Zero shot prompt used for the statements coding

```
You are given central bank communication. Your task is classify
   each communication event into three categories depending on
   whether the communication event implies monetary tightening,
   easing or status quo.

A value of 1 is assigned to hawkish communication.
A value of -1 is assigned to dovish communication.
A value of 0 is assigned to neutral communication.

Now classify the following statements. Do not give any
   justification, just return "Response {response number}:" and
   1,-1 or 0 for each statement. Before submitting always check
   that for each statement you report only 1,-1 or 0.

Statements to classify:
```

Single shot prompt used for the statements coding

```
You are given central bank communication. Your task is classify
   each communication event into three categories depending on
   whether the communication event implies monetary tightening,
   easing or status quo.

A value of 1 is assigned to hawkish communication.
A value of -1 is assigned to dovish communication.
A value of 0 is assigned to neutral communication.

To give you a clearer view, we provide 3 example statements.

Example dovish statement
Mario Draghi (24/9/2014 at 8:36): Monetary policy will remain
   accommodative for a long time and I can tell you that the (ECB
   ) Governing Council is unanimous in committing itself to using
    the tools at its disposal to bring inflation back to just
   under two percent.
```

```
Example neutral statement
Ewald Nowotny (25/9/2012 at 13:09): I do not see the need for a
   change in interest rates currently in the euro zone. In terms
   of the deposit facility, negative rates would indeed be
   theoretically possible but in practical terms I would not
   consider such a view to be either desirable or realistic.

Example hawkish statement
Jurgen Stark (10/6/2011 at 15:25): The ECB is likely to raise
   rates to 1.5 percent next month. We signalled yesterday the
   preparedness to take another step, maybe in July. That is a
   high probability. Source: Reuters Insider/TV

Now classify the following statements. Do not give any
   justification, just return "Response {response number}:" and
   1,-1 or 0 for each statement. Before submiting always check
   that for each statement you report only 1,-1 or 0.
```

Sample Statements Classification Examples

Table A1: Prompts Classification Example

Date	GC Member	Statement	Human Classification	AI Classification
2008-03-04	Orphanides	We expect some slowdown in the economy compared to the growth rate of last year.	-1	-1
2008-03-07	Weber	There seems to be some underestimation of inflation risks in the market. We made clear by publishing our staff forecast that we do see persistent and prolonged inflation risks," he said. "For me, the way forward (for monetary policy) is pretty clear. Weber said the euro zone growth slowdown that started in the last three months of 2007 seemed to be continuing but economic activity should start to return to its long-term trend in the second half of this year.	1	1
2008-03-11	Constancio	So far, we have analysed the risks of the financial turbulence and interest rates have been considered as being adequate to control the risk of inflation at this moment. We will see in coming months.	0	0
2008-03-17	Liebscher	We have lowered our forecast, but we still see moderating, but ongoing economic growth.	0	-1
2008-03-18	Stark	The fact that inflation is that high and is expected to remain at an elevated level for a couple of months is our major concern. "The major risk to economic growth is coming from the potential impact of the financial market turmoil, particularly via a further tightening of credit standards. But we also have to take into account other risks, including the sharp increase in commodity prices that might have a dampening effect. European growth, while projected to be lower this year than in 2008, is still robust.	0	1

Regression results: Restricted Sample (2008 - 2014)

Table A2: ECB Communication and Future Monetary Policy - Zero Shot GPT3.5, Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.17	0.44	0.04	0.36	0.19	0.45	0.09	0.37
	(0.31)	(0.29)	(0.32)	(0.30)	(0.31)	(0.29)	(0.33)	(0.31)
$comm_{AI,i,\tau}$	4.69***		3.85***		4.29***		4.82***	
	(1.24)		(1.28)		(1.31)		(1.25)	
$comm_{human,i,\tau}$		2.49***		2.16***		2.39***		2.53***
		(0.64)		(0.69)		(0.68)		(0.64)
$i_{t,12} - i_{t,3}$			2.71*	1.81				
			(1.46)	(1.56)				
$i_{t,12} - i_{t,1}$					0.96	0.48		
					(1.01)	(1.12)		
$i_{t,3} - i_{t,1}$							-1.17	-1.14
							(1.76)	(1.75)
Log-Likelihood	-34.86	-32.85	-33.09	-32.16	-34.41	-32.75	-34.64	-32.63
No. observations	68	68	68	68	68	68	68	68
Pseudo R^2	0.29	0.33	0.33	0.34	0.30	0.33	0.29	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table A3: ECB Communication and Future Monetary Policy - Single Shot GPT3.5, Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.43	0.44	0.23	0.36	0.42	0.45	0.47	0.37
	(0.29)	(0.29)	(0.31)	(0.30)	(0.29)	(0.29)	(0.30)	(0.31)
$comm_{AI,i,\tau}$	3.92***		3.26***		3.72***		4.00***	
	(1.11)		(1.12)		(1.16)		(1.15)	
$comm_{human,i,\tau}$		2.49***		2.16***		2.39***		2.53***
		(0.64)		(0.69)		(0.68)		(0.64)
$i_{t,12} - i_{t,3}$			3.07**	1.81				
			(1.43)	(1.56)				
$i_{t,12} - i_{t,1}$					1.77*	0.48		
					(1.00)	(1.12)		
$i_{t,3} - i_{t,1}$							0.79	-1.14
							(1.71)	(1.75)
Log-Likelihood	-35.57	-32.85	-33.13	-32.16	-33.93	-32.75	-35.46	-32.63
No. observations	68	68	68	68	68	68	68	68
Pseudo R^2	0.27	0.33	0.32	0.34	0.31	0.33	0.28	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table A4: ECB Communication and Future Monetary Policy - Zero Shot GPT4, Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.67**	0.44	0.51*	0.36	0.66**	0.45	0.61**	0.37
	(0.29)	(0.29)	(0.30)	(0.30)	(0.29)	(0.29)	(0.30)	(0.31)
$comm_{AI,i,\tau}$	2.35***		1.91***		2.12***		2.46***	
	(0.65)		(0.68)		(0.69)		(0.68)	
$comm_{human,i,\tau}$		2.49***		2.16***		2.39***		2.53***
		(0.64)		(0.69)		(0.68)		(0.64)
$i_{t,12} - i_{t,3}$			2.62*	1.81				
			(1.47)	(1.56)				
$i_{t,12} - i_{t,1}$					0.92	0.48		
					(1.05)	(1.12)		
$i_{t,3} - i_{t,1}$							-1.23	-1.14
							(1.68)	(1.75)
Log-Likelihood	-35.46	-32.85	-33.80	-32.16	-35.07	-32.75	-35.19	-32.63
No. observations	68	68	68	68	68	68	68	68
Pseudo R^2	0.28	0.33	0.31	0.34	0.29	0.33	0.28	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

Table A5: ECB Communication and Future Monetary Policy - Single Shot GPT4, Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δi_t	0.67**	0.44	0.48	0.36	0.65**	0.45	0.61**	0.37
	(0.28)	(0.29)	(0.30)	(0.30)	(0.28)	(0.29)	(0.29)	(0.31)
$comm_{AI,i,\tau}$	2.15***		1.76***		1.92***		2.24***	
	(0.63)		(0.66)		(0.66)		(0.64)	
$comm_{human,i,\tau}$		2.49***		2.16***		2.39***		2.53***
		(0.64)		(0.69)		(0.68)		(0.64)
$i_{t,12} - i_{t,3}$			2.94**	1.81				
			(1.42)	(1.56)				
$i_{t,12} - i_{t,1}$					1.14	0.48		
					(1.01)	(1.12)		
$i_{t,3} - i_{t,1}$							-1.07	-1.14
							(1.63)	(1.75)
Log-Likelihood	-36.65	-32.85	-34.41	-32.16	-36.00	-32.75	-36.44	-32.63
No. observations	68	68	68	68	68	68	68	68
Pseudo R^2	0.25	0.33	0.30	0.34	0.27	0.33	0.26	0.33

Notes: Robust standard errors in parentheses. * p¡.1, ** p¡.05, ***p¡.01.

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